REPORT OF INVESTIGATIONS NO. 57

OHIO DIVISION OF GEOLOGICAL SURVEY GEOLOGY OF THE MALVERN QUADRANGLE, OHIO

STATE OF OHIO JAMES A. RHODES, GOVERNOR DEPARTMENT OF NATURAL RESOURCES FRED E. MORR, DIRECTOR DIVISION OF GEOLOGICAL SURVEY RALPH J. BERNHAGEN, CHIEF

GEOLOGY OF THE MALVERN QUADRANGLE, OHIO By Richard M. DeLong 1965

EXPLANATION (for graphics – consult map)

- Qal, Recent alluvium
- Qwc, Wisconsin erosional terrace
- Qws, Wisconsin slack-water silts
- Qwo, Wisconsin gravel outwash terrace
- Qwo, Wisconsin gravel outwash terrace

CONEMAUGH GROUP (for graphics – consult map)

- bc, Brush Creek Coal
- m, Mahoning Coal

ALLEGHENY GROUP (for graphics – consult map)

- uf, Upper Freeport Coal
- lf, Lower Freeport Coal
- mk, Middle Kittanning Coal
- lk, Lower Kittanning Coal

- Contact(for graphics – consult map)
- Coal
- Long dashed where approximately located; short dashed where concealed

- Structure contours drawn on Middle Kittanning Coal. Contour interval, 20 feet; datum, mean sea level.

- Illinoian glacial boundary (after DeLong and White, 1963) (for graphics – consult map)

- Gravel pit / Dry hole with show of oil and gas (for graphics – consult map)
- Quarry, abandoned / Abandoned gas well- Dry hole with show of gas – Dry hole
- Strip mine, post 1960
- Abandoned slope or shaft mine with coal designated

ECONOMIC GEOLOGY

Coal

The Lower Kittanning Coal ranges from 2 to 3 1/2 feet in thickness and averages 2 1/2 feet throughout its outcrop area; no thick partings or cutouts have been observed. These characteristics are believed to be typical wherever this coal occurs in the quadrangle (Brant, 1954, fig. 6, p. 24). Estimated original reserves for this bed on a township basis are given by Brant (1954, p. 27), and DeLong and White (1963, p. 160).

The Middle Kittanning Coal is 2 to 4 feet thick in the northwestern part of the quadrangle and has an average thickness of 2 1/2 feet. The coal is without thick partings or extensive cutouts in its outcrop area and is believed to have this continuity throughout the quadrangle (Brant, 1956, fig. 5, p. 21). Estimated original

reserves by township are given by Brant (1956, p. 24) and DeLong and White (1963, p. 160).

The Lower Freeport Coal ranges from a few inches to 2 feet in thickness in this area. Abandoned mining operations are found in the SW 1/4 sec. 29,
S 1/2 sec. 31, and SE 1/4 sec. 8, Brown Township, Carroll County, and in the SW 1/4 sec. 31, Paris Township, Stark County.

The Mahoning Coal is restricted to Harrison and Rose Townships, Carroll County. It thickens to about 2 feet in secs. 35 and 36 of Harrison Township where it was formerly mined. The coal occurs in two benches with 3 to 6 inches of shale separating a thin upper bench from the main bench of coal.

Other coals in the Malvern quadrangle are thin and only of stratigraphic
interest.

Clay

The Lower Kittanning and Middle Kittanning Clays are the basis for the ceramic industry along the Sandy Creek valley. The Lower Kittanning Clay is also used for the manufacture of lightweight aggregate at Pekin. The Lower Kittanning Clay is plastic, carbonaceous at the top, and ranges from 5 to 14 feet in thickness, but the usual thickness is 5 to 8 feet.

The Middle Kittanning Clay averages close to 6 feet in thickness, but ranges from 3 to 10 feet within a single mining operation. The clay is plastic and silty; limonite staining is common.

Clays associated with other coal beds in this area are discontinuous, generally thin, and of low plasticity.

Limestone

The limestones of the Malvern quadrangle are thin and irregular. The Upper Freeport Limestone is the thickest, and has been quarried in small operations for local use as agricultural lime, but its reserves are insufficient to be mined on a large scale. Its greatest known thickness is in the SE 1/4 sec. 25, Brown Township where there is 3 feet of bedded, light-gray, finely crystalline limestone which overlies about 10 feet of nodular limestone in clay. This limestone was also quarried in the SW 1/4 sec. 35, Harrison Township, Carroll County.

Shale

The Lower Freeport Shale ranges from 20 to 50 feet in thickness along Sandy Creek valley. This unit was formerly mined and blended with the Lower Kittanning Clay for the manufacture of common clay product*.

The Upper Freeport and Lower Mahoning Shales, which have been utilized by the ceramic industry to the north, are largely replaced by sandstone in this quadrangle. The Buffalo Shale, used in the manufacture of brick in Columbiana and Harrison Counties, caps the hills in the southern part of the quadrangle.

Sandstone

The Upper Freeport and Lower Mahoning Sandstones are coalesced southwest of Malvern, forming a conformable sandstone body 125 feet in thickness that consists of fine- to medium-grained sandstone, massive in places but usually thin to medium bedded. A similar sandstone body is quarried for foundry sand, as well as for crushed and broken stone, in sec. 27, Rose Township, Carroll County (Mineral City quadrangle). The unconformable channel-fill facies of the Lower Mahoning Sandstone is not of economic value.

Sand and Gravel

Sand and gravel, deposited by glacial meltwater, occurs in terraces along Sandy Creek, Little Sandy Creek, and Hugle Run. Armstrong Run is barren of sand and gravel. Sand and gravel is extracted in the SE 1 /4 sec. 13, Brown Township, Carroll County.

Oil and Gas

A small amount of gas has been produced from the "Clinton Sand" in sec. 32, Paris Township, Stark County, and in sec. 7, Brown Township, Carroll County. This formation was dry in tests located in secs. 1 and 26, Brown Township. The "Clinton Sand" lies about 4,000 feet below sea level in this region.

The Berea and Cussewago (Second Berea of drillers) Sandstones yield a show of gas or oil at some localities, but have not produced in commercial quantities in this area. The Berea occurs approximately at sea

level in this quadrangle.

Salt

The salt deposits of northeastern Ohio are of Silurian age, and in this quadrangle are found at 3,200 feet below sea level. The salt occurs in several beds aggregating 200 to 300 feet in thickness (Pepper, 1947, fig. 1, p. 228) that

REFERENCES CITED

Brant, R. A, 1954, The Lower Kittanning No. 5 coal bed in Ohio: Ohio Geol. Survey Rept. Inv. 21, 59 p.
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DeLong, R. M., and White, G. W., 1963, Geology of Stark County: Ohio Geol. Survey Bull. 61, 209 p.
Pepper, J. F., 1947, Areal extent and thickness of the salt deposits in Ohio: Ohio Jour. Sci., V. 47, p. 225-239.

BASE MAP BY U.S. GEOLOGICAL SURVEY I960
DRAFTING BY DON K. SMITH AND JAMES A. BROWN HAL FLINT, CHIEF DRAFTSMAN

QUATERNARY MAPPED BY JANE L.FORSYTH ROSE TOWNSHIP AFTER JESSE R, UPPERCO

OHIO DIVISION OF GEOLOGICAL SURVEY GEOLOGY OF THE MALVERN QUADRANGLE, OHIO

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Note: Unable to translate lithology chart on map.

[OCR on map text performed on 3/12/15 - Jana Murphy OSUL]

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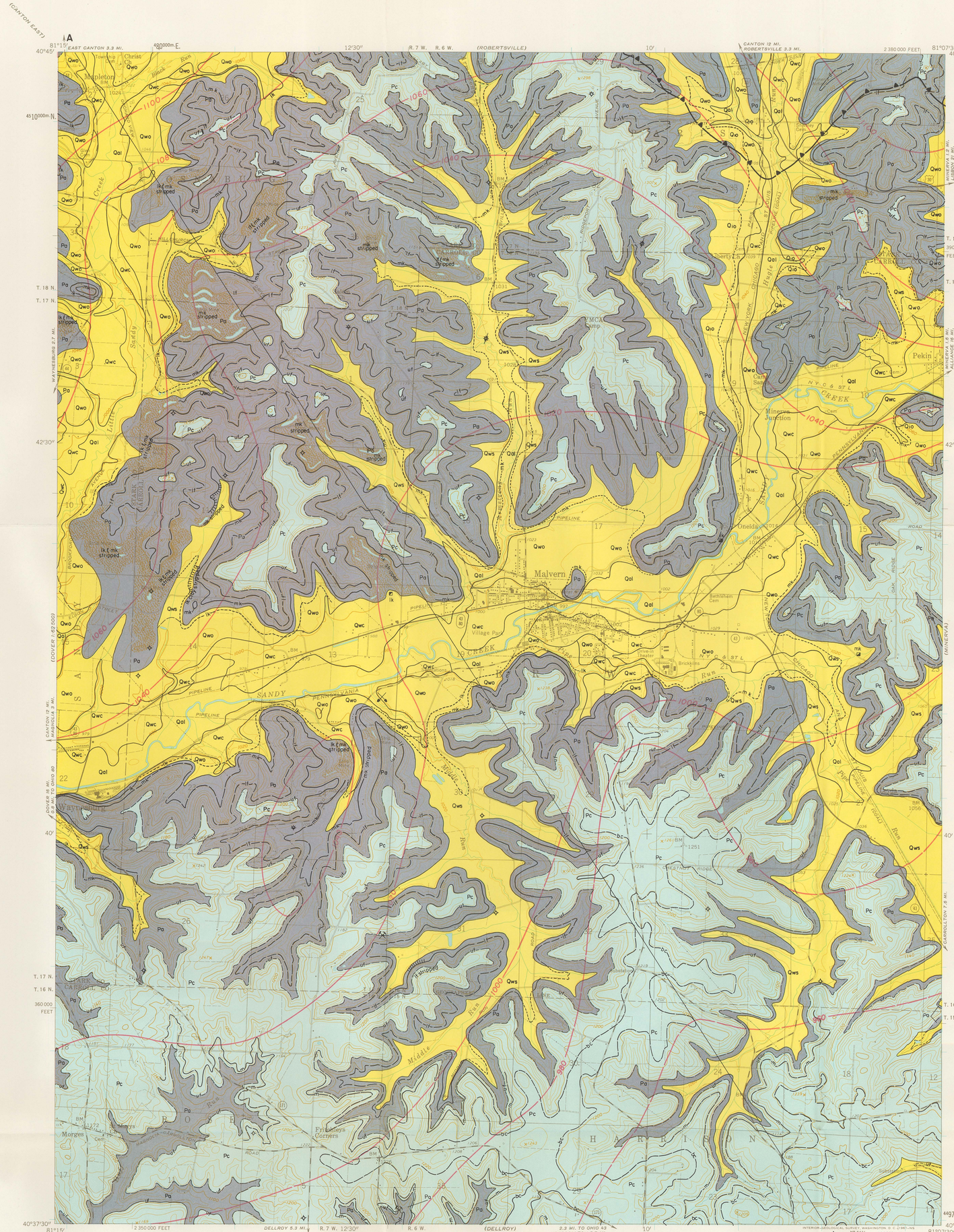
SYSTEM	GROUP	FORMATION, MEMBER, OR BED	LITHOLOGY	THICKNESS IN FEET	DESCRIPTION
QUATERNARY		Recent alluvium Wisconsin gravel outwash and slack-water silts Illinoian gravel outwash		0-200	Alluvium, underlain by Wisconsin gravel in the valleys of Sandy Creek, Little Sandy Creek, and Hugle Run. Gravel outwash (Qwo) forming flat-topped terraces, generally with 3-foot silt caps, in valleys of Sandy Creek, Little Sandy Creek, and Hugle Run. Terraces locally are gravel bars whose elevations decrease downstream and away from the main channel. Silt terraces (Qws), locally covered by thin alluvium, form broad flats in all other valleys, grading into gravel terraces where valleys meet Sandy Creek, Little Sandy Creek, or Hugle Run. Erosional terraces (Qwc) are cut into gravel outwash terraces at several lower levels, with varying thicknesses of alluvial cover; highest cut terraces west of Malvern may be constructional. Gravel outwash (Qio) in form of silt-capped terraces with hummocky surfaces; age interpreted from soils data.
PENNSYLVANIAN	CONEMAUGH	Buffalo Shale	25 ft	40 ±	Shale, gray, bedded at base; upper part not exposed, probably consists of soft shales and siltstones.
		Brush Creek Coal		0.1-0.7	Coal, impure, shaly; the overlying marine Brush Creek beds are absent, but occur in the Dellroy quadrangle to the south.
		Upper Mahoning Shale and Sandstone		70	Shale and sandstone: shale, dark-gray below, grading upward into tan, thin-bedded shale and shaly sandstone, followed by shale and clay; sandstone, fine-grained, thin-bedded, with shale interbeds. South of Malvern conformable thin-bedded sandstones and shales, representing the coalesced Lower and Upper Mahoning Sandstones, replace the Mahoning Coal and Thornton Clay.
		Mahoning Coal Thornton Clay		0-2 0-2	Coal, commonly in two benches separated by shale up to 8 inches thick. Restricted to Rose and western Harrison Townships, Carroll County. Clay, light-gray, plastic.
		Lower Mahoning Shale and Sandstone		9-40	Shale and sandstone: shale, light-gray to tan, thin-bedded, with siltstone; sandstone, light-gray, thin- to medium-bedded, fine-grained. Locally, south of Malvern, the Lower Mahoning Sandstone coalesces with the overlying Upper Mahoning Sandstone and underlying Upper Freeport Sandstone to form a single sandstone unit up to 125 feet thick that conformably overlies the Lower Freeport Coal; the Upper Freeport and Mahoning Coals, with their associated clays and fresh water limestones, are replaced by this sandstone body. South of Morges, in secs. 11 and 17, Rose Township, Carroll County, the Lower Mahoning Sandstone occurs as a channel deposit 74 feet thick resting unconformably on or near the Lower Freeport Coal; this channel sandstone is gray, fine to coarse grained, conglomeratic at the base, micaceous, massive below, thin bedded and shaly toward the top.
		Upper Freeport (No. 7) Coal Upper Freeport Clay Upper Freeport Limestone		0-1 0-1 0-14	Coal, generally absent south of Sandy Creek. Clay, gray, silty, semiplastic, discontinuous. Limestone, light-gray, finely crystalline, bedded to nodular. Discontinuous, but more persistent than Upper Freeport Coal.
		Bolivar Coal Bolivar Clay Shawnee Limestone		0-0.1 0-1 0-2	Coal, local, restricted to northwestern part of quadrangle. Clay, gray, local, restricted to northwestern part of quadrangle. Limestone, gray, local, bedded to nodular.
	ALLEGHENY	Upper Freeport Shale and Sandstone		23-80	Shale and sandstone: shale, light-gray, thin-bedded; shales at top of unit are tan, thin, and poorly bedded; sandstone, tan to light-gray, generally thin- to medium-bedded, locally massive and unconformable at base, poorly sorted, micaceous, some calcareous cement in upper part; laterally interbedded with tan sandy shale, locally coalesces with the overlying Mahoning Sandstones to form an unusually thick continuous sandstone sequence. Entire unit replaced by the Lower Mahoning Sandstone in secs. 11 and 17, Rose Township, Carroll County.
		Lower Freeport (No. 6a) Coal Lower Freeport Clay Lower Freeport Limestone		0-1.8 0-5 0-4	Coal, discontinuous, generally thin. Clay, light-gray, silty, low in plasticity, discontinuous. Limestone, gray, nodular to bedded, with clay interbeds, discontinuous.
				0-0.2	Coal, local.
		Lower Freeport Shale and Sandstone		56-97	Shale and sandstone: shale, light-gray to tan, thin-bedded, with ellipsoidal ironstone nodules up to 1 inch in diameter, becomes increasingly sandy upward, grading into sandstone; shale at top of unit is gray to pale olive green and poorly bedded, contains freshwater limestone nodules at most localities, and grades from sandstone below to clay above. Sandstone is medium to thin bedded, very fine to fine grained, and at places carbonaceous. Locally a coal about 3 inches thick occurs about 10 feet below the Lower Freeport Coal.
		Washingtonville Shale Middle Kittanning (No. 6) Coal		0-1 2-4	Shale, dark-gray, thin-bedded, marine, sparsely fossiliferous. Coal, with thin discontinuous partings and pyrite lenses.
		Middle Kittanning Clay		3-10	Clay, light- to medium-gray, plastic.
				0-0.1	Coal, local.
		Strasburg Coal		0-0.3	Coal, local.
		Middle Kittanning Shale and Sandstone		22-28	Shale and sandstone: shale, medium-gray to light-medium-gray upward, thin-bedded, silty; shale constitutes the full thickness of this unit at most localities; ironstone in thin layers and nodular concretions up to 6 inches in diameter locally present in lower part; sandstone, light-gray to tan, thin- to medium-bedded, locally present in the middle of the unit.
		Columbiana Shale and Limestone		0.5-3	Shale and limestone: shale, dark-gray, thin-bedded, marine, fossiliferous; limestone, nodular, carbonaceous, local.
		Lower Kittanning (No. 5) Coal		2-3.5	Coal, with thin discontinuous partings and pyrite lenses.
		Lower Kittanning Clay		5-14	Clay, light-gray, plastic, locally contains sandy calcareous nodules.
		Clarion Shale	25 ft	40 ±	Shale and fine-grained sandstone, poorly exposed, at stream level west of Little Sandy Creek.



BASE MAP BY U.S. GEOLOGICAL SURVEY 1960

DRAFTING BY DON K. SMITH AND JAMES A. BROWN
HAL FLINT, CHIEF DRAFTSMAN

SCALE 1:24 000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

34°
MAGNETIC NORTH
TRUE NORTH
APPROXIMATE MEAN DECLINATION, 1960

OHIO
QUADRANGLE LOCATION

QUATERNARY MAPPED BY JANE L. FORSYTH
ROSE TOWNSHIP AFTER JESSE R. UPPERCO

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1020 — Structure contours drawn on Middle Kittanning Coal. Contour interval, 20 feet; datum, mean sea level

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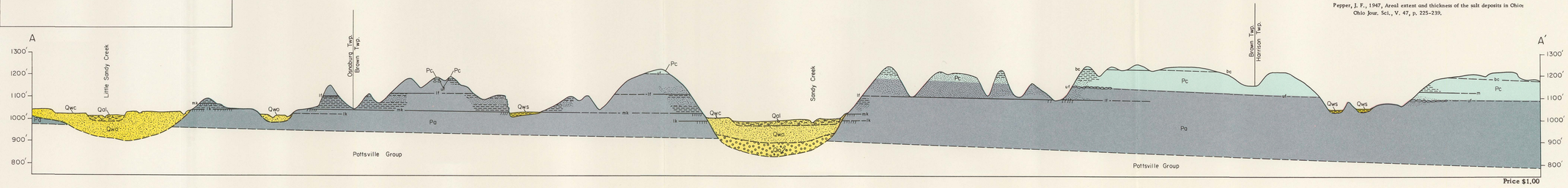

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